REMARKS

Reconsideration of this application in light of the present amendment and remarks is respectfully requested.

Claims 1-22 have been rejected.

Claims 1, 2, 4, 9, 11, 13 and 17 have been amended.

Claims 1-22 are pending in this application.

In regards to inventorship, the subject mater of the claims was commonly owned at the time the inventions were made. In addition, the subject mater of the present invention is commonly owned with cited reference Remboski et al (US 5,804,711), although with separate inventors.

Claims 1-2, 4-10 and 17-22 have been rejected under 35 U.S.C. §102(b) as being anticipated by Remboski et al (US 5,804,711), hereinafter "Remboski". This rejection is respectfully traversed.

Claim 1 has been amended to include a correction of acceleration samples using a fueled acceleration profile that describe the acceleration profile of the engine during normal operation. Support for this can be found in claim 2 (subsequently amended) and in the specification on page 6 lines 17-32). In addition, the acceleration samples are taken using a central difference algorithm (recited and further specified in amended claim 4), whereas Remboski uses a completely different averaging algorithm (col. 6 equations 1 and 2).

Advantageously, applicants' use of a central difference algorithm provides improved signal-to-noise, which can be used to detect not only hard and soft misfires, but also multiple misfires. This is accomplished by using the central difference to remove non-linearities to improve high frequency noise rejection.

Remboski, although an improvement in the art, uses a simple acceleration measurement of a change in velocity over time (dv/dt) that can generate harmonics, whereas applications' invention provides an improved measurement by taking a difference in velocities, which effectively results in an acceleration measurement with angle (dv/dθ) instead of time, as in the prior art. This eliminates the creation of harmonics and provides high frequency attenuation (see specification page 8 line 15 to page 9 line 7).

Applicants' invention of claim 1 provides a solution to a designer's problem of increasing signal-to-noise for detecting not only soft and hard misfires, but also multiple misfires.

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Accordingly, applicant's amended independent claim 1 is deemed patentably distinct and nonobvious from Remboski. Similarly, independent claims 11 and 17 have been amended to include those recitations of claim 1, as are deemed allowable as well for the same reasons.

The dependent claims also provide several novel aspects over Remboski.

Claim 2 has been amended to reflect that the fueled correction profile is adapted during engine operation with respect to speed and load. Support for this can be found in the specification on page 6, line 33 (last line) to page 7, line 1. Remboski does not provide a fueled correction profile, and therefore could not envision adapting a fueled correction profile using engine speed and load.

Claim 4 has been amended to specify the central difference algorithm. Support for this can be found in the specification on page 8 line 20 to page 9 line 2. Taking a difference highlights the difference between signals, making this technique more sensitive than using the averaging technique of Remboski.

Claim 5 (and 18) provides a novel technique to accommodate fractional rotational angles. Remboski only uses an integer sample interval of rotation. Moreover, Remboski does not suggest or disclose weighting or integrating samples. See the specification on page 12 last paragraph to page 13 first two paragraphs.

Claim 6 (and 19) provides the decimation of the samples to a lower rate that is not necessarily an integer factor of the sample rate, whereas Remboski uses integer sampling. This operation is performed to decimate the high-data-rate signal to the firing rate signal for all channels. The advantage of interpolation gives the present invention universal application for any number of engine cylinders. In other words, any number of samples per rev can be used with any cylinder count and/or even and odd firing. See the specification on page 13 first full paragraphs.

Claim 7 (and 20) provides an improvement over standard STWTM sampling by incorporating an offset to improve performance. STWTM filter offsets are not disclosed or suggested in the prior art. See the specification on page 9 line 17 to page 11 line 5.

Claim 8 (and 21) provides a technique to detect multiple misfires in a third channel, which is not addressed in Remboski. Further, data from one channel is used in the third channel using a different detection technique to detect the multiple misfires. Since Remboski does not disclose a third channel, Remboski could not envision applicants' solution to use a first channel of data in a third channel, with a different detection algorithm, to detect multiple misfires.

Claim 9 has been recast to reflect that the fueled correction is band-limited to reduce both DC and second order effects. Support for this can be found in the specification on page 7, lines 7 to 14. Remboski does not use fueled correction, and therefore could not envision band-limiting the fueled correction.

Claim 10 (and 22) provides for the measurement of more than just acceleration. The specifics of this can be found in the specification on page 13 last paragraph to page 16 line 7. The prior art does not suggest or disclose applicants' novel central difference provision for measuring parameters, and therefore could not envision applicants' novel technique to determine work, power, torque, and IMEP using the improved signal-to-noise provided thereby.

Further, claims 2 and 4-10 are dependent on amended claim 1, and the above comments with respect to claim 1 is hereby incorporated by reference. Therefore, claims 2 and 4-10 are also deemed allowable as well for the same reasons.

Similarly, claims 18-22 are dependent on amended claim 17, and the above comments with respect to claim 17 are hereby incorporated by reference. Therefore, claims 18-22 are also deemed allowable as well for the same reasons.

Therefore, applicants respectfully request that this rejection be withdrawn.

Claims 3 and 11-16 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Remboski. This rejection is respectfully traversed.

Claim 3 is distinct by providing not only a highpass filter but also a non-linear highpass filter. The prior art specifically seeks to use lowpass filter to detect only 0.5 and 1.0 order signals, whereas the present invention embraces signals up to fourth-order in order to detect multiple misfires. Therefore, the prior art teaches away from applicants' invention.

Moreover, claim 3 is dependent on amended claim 1, and the above comments with respect to claim 1 is hereby incorporated by reference. Therefore, claim 3 is also deemed allowable as well for the same reasons.

Applicants submit that independent claim 11 has been amended into a condition for allowance as described above.

Claim 12 has similar recitations as claim 3, distinguished above.

Claim 13 has similar recitations as claim 4, previously distinguished.

Claim 14 has similar recitations as claim 5, previously distinguished.

Claim 15 has similar recitations as claim 7, previously distinguished.

Claim 16 has similar recitations as claim 8, previously distinguished.

Moreover, claims 12-16 are dependent on amended claim 11, and the above comments with respect to claim 11 are hereby incorporated by reference. Therefore, claims 12-16 are also deemed allowable as well for the same reasons.

Therefore, applicants respectfully request that this rejection be withdrawn.

The other references of record have been reviewed and applicant's invention is deemed patentably distinct and nonobvious over each taken alone or in combination.

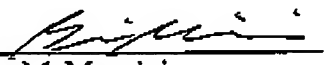For the foregoing reasons, applicants respectfully request that the above rejections be withdrawn.

Inasmuch as this amendment distinguishes all of the applicants' claims over the prior art references, for the many reasons indicated above, passing of this case is now believed to be in order. A Notice of Allowance is earnestly solicited.

No amendment made was related to the statutory requirements of patentability unless expressly stated herein. No amendment made was for the purpose of narrowing the scope of any claim, unless applicant has argued herein that such amendment was made to distinguish over a particular reference or combination of references.

Authorization is hereby given to charge any fees necessitated by actions taken herein to Deposit Account 50-2117.

Respectfully submitted,
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